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Review Article

Anemia Overview

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ABSTRACT

Anemia is most significant public health problem worldwide. In both rich and poor countries, it characterized by a decrease in the number of red blood cells or the hemoglobin concentration. It effects the all-age groups but is most prevalent amount children and also pregnant women. Anemia among teenager can be seriously almost entirely caused by a lack of substance iron.common symptoms like fatigue, weakness and pale skin. anemia diagnostic method such as the complete blood test (CBC), serum ferritin testing. The article introduces the introduction of anemia, etiology, pathophysiology, prevention, diagnosis, method and public health awareness. about the anemia 50% of the two billion anemia cases worldwide are caused by iron deficiency anemia. in this article review database including scopus, google scholar, research gate and pubmed.

INTRODUCTION

Anemia is one of the widest spread public problems through in the world. In this condition more developing from that countries where people suffer from malnutrition and helminthic infection. In this condition characterized by a deficiency in the number of red blood cells (RBC) in the blood and also hemoglobin in the blood hemoglobin is iron – protein in red blood cells that carries oxygen to the whole bodies when the bodies have not proper red blood cells or hemoglobin that oxygen carries capacity of the blood is low or reduced,in the tissues or organs and then show sign and symptoms and show their complication. It happens in all stages of human life especially in women and children then pregnant women effected in the world wide. anemia is about 1.62 billion people and then children which means pre- school children the highest prevalence is 74.4% and then men is lowest prevalence is 12.7% only. Today anemia is the second leading diseases cause in the world and the one of the most significant public health issues in the world according to(WHO

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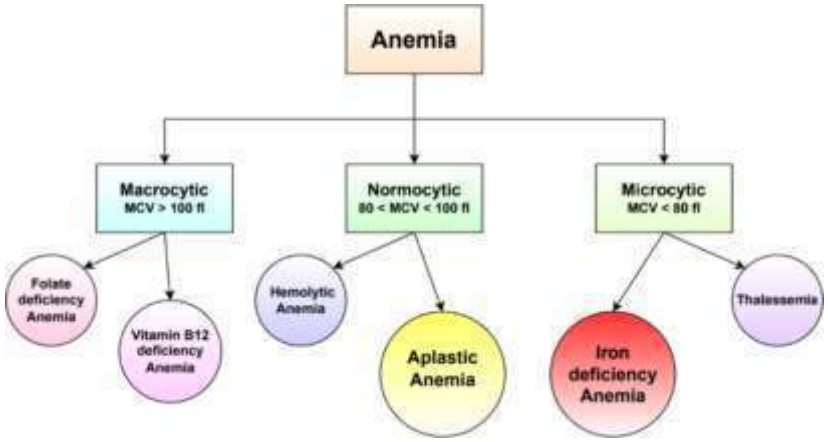
2018). Anemia can be cause by variety of factors including poor diet, chronic disease, genetic disorders and blood loss. the symptoms including like fatigue, shortness of breath, dizziness and pale skin. In severe cases, anemia can lead to serious complication such as heart problem, organ damage and increased risk of infections. According to who report 2 billion people are suffering from anemia in world of which major portion is from south Asia. Anemia which means hemoglobin (HB) Concentration level is lower than 11g/dl for pregnant women and children (6 month to 5 Years) 12g/dl for children 6-14 age and 13g/dl for men.

1. Types of Anemia



Source :- https://www.nature.com/articles/s41598-024-84120-w

- **Iron deficiency anemia**

This is the most common type of anemia in the world. Iron deficiency anemia develops when you don't have enough iron in your which reduce production of hemoglobin and cause iron deficiency anemia.

- **Vitamin deficiency anemia**

Vitamin deficiency anemia is a condition where body doesn't have enough amount of healthy RBC due to the lack of certain types of vitamins and amino acid or folic acid, vitamin B12 which are essential for RBC cell production**.**

- **Sickle cell anemia**

Sickle cell anemia is a severe form of the inherited blood disorder sickle cell diseases. It is caused by the genetic changes (Mutation) that lead to abnormal RBC cells are became like a sickle cell.

- **Thalassemia anemia**

It is blood related and genetic disorder. It passes for, parents to children through gens, gene carry information. Thalassemia causes the body to have less of the protein hemoglobin than usual. Hemoglobin is present in RBC cells to carry oxygen not having enough hemoglobin or RBC cells can lead to a condition called anemia.

2. Search method (Sources, data collection)

This article review uses various database such as Google Scholar, Pubmed,Science Direct, scopus and Research Gate. The keywords used in the article review such as Anemia, pathophysiology, prevention of anemia, diagnosis and treatment were used. Article published between 2016 to 2025 were considered. and some additional information was obtained from the text book and official organization website.

3. Etiology

- **Iron deficiency anemia**

Iron deficiency anemia occurs when the body have insufficient iron to produce hemoglobin. the causes of iron deficiency anemia can be classified into several broad categories According to who estimated that about 50% of anemia is related to iron deficiency Adequate iron intake.

A diet which has lack of iron rich foods or consumes a low iron rich protein such as red meat, and fortified cereals plant - based diet may lack of sufficient heme iron and may be at higher risk due to lower iron bioavailability from plant bases sources.

- **Blood loss (Menstrual, ulcer, GI)**

Heavy menstrual periods can cause iron deficiency in women due to monthly blood loss. Gastrointestinal disorders such as celiac disease, crohn's disease or atrophic gastritis can impair iron absorption in intestine. Chronic diarrhea led to loss iron before it can be absorbed. Parasite infections hookworm and other intestinal parasite cause blood loss.

- **Sickle cell anemia**

Sickle cell anemia is a genetic disorder that affects the production of hemoglobin, causing red blood cells to be misshaped and break down prematurely. Sickle cell anemia is caused by a mutation in the HBB of beta-globin chain of hemoglobin

- **Bone marrow failure**

Bone marrow failure refers to the condition where bone marrow is unable to produce enough RBC and also white blood cell platelets. This can be caused by various factors including immune system attacks on steam cells. exposure to toxins or drugs, inherited condition and certain type of infections**.**

4. Pathophysiology

Anemia is defined as a reduction of red cell mass below the normal range for age and sex of the individual and reduction in the oxygen carrying capacity of blood, primarily due to the decrease in the number of red blood cells (RBC) or hemoglobin concentration. In adult, hematocrit below 35% (HB below 13g/dl) male and below 35% (Hb Below 12g/dl) in female is level for diagnosis of anemia

The pathophysiology of anemia involves in multiple mechanism depending on the type and cause of anemia

- **Blood loss**

Chronic or acute blood loss reduce the number of RBC cell. common cause like any trauma and heavy menstrual bleeding.

- **Impaired hemoglobin**

In any case RBC count adequate, If hemoglobin synthesis is defective anemia can occur.

- **Decrease RBC cell production**

In the condition where bone marrow not produce proper amount of RBC cells anemia can occurs.

Types of Anaemia: Anemia arises as a result of a variety of defects in RBC such as impaired production as seen in aplastic anemia, impaired maturation deficit in megaloblastic anemia, errors in hemoglobin synthesis characterized by iron deficiency anemia, genetic defects of hemoglobin maturation manifested in thalassemia, synthesis of abnormal hemoglobin detected in hemoglobinopathies, sickle cell anemia and

thalassemia and weight loss of RBC's are in haemolytic anaemias.

Iron-Deficiency Anaemia: IDA is one of the most common anaemia in world as well as in India. It is a condition in which there is deficiency of iron in the bloodstream. Haemoglobin, a protein is present in RBC which carries oxygen throughout the body. The body needs iron to make haemoglobin. Without enough iron, less haemoglobin and fewer RBCs are made, leading to anaemia. Iron is essential for the various functions of the human body, especially in the synthesis of hemoglobin. Adolescents and women are more likely to develop anemia (Prema R 1992).

Causes

- Diets low in iron
- Inability to absorb iron
- Abnormalities of GIT (Gastrointestinal tract)
- Internal bleeding
- Pregnancy, menopause, blood loss due to periods
- Excessive blood donation

Symptoms

- Tiredness,
- Irritability
- Feeling faint
- breathlessness
- Headache
- Palpitation
- Sore or swollen tongue, altered taste
- Pregnancy anemia increases the risk of complications.

For both mother and baby, including low birth weight, premature birth, and postpartum depression. Anemia in the newborn can be caused by the lack of iron reserves in the baby. In addition, vitamin C helps to absorb iron in the body. Iron diet treatment and iron supplements often make anemia better. If you are taking iron pills, your doctor may recommend taking them along with a source of vitamin C, such as a glass of orange juice or an orange fruit.

Pernicious Anaemia: (Pernicious means destructive or injurious) Once thought to be a deadly disease, this type of anemia was given the name "dangerous." Vitamin B-12 injections or B-12 oral supplements can now be used for treatment.

Causes

- Inadequate diet
- Vitamin B12 deficiency
- Intrinsic Factor deficiency in the body
- Gastrointestinal tract infection

Symptoms

- Fatigue
- Breathlessness
- Pale skin
- Chest pain
- Poor coordination, balance difficulties
- Slow reflexes
- Depression

Which red blood cells (RBCs) are separated from the blood until they reach the end of their natural life. People of all ages, races, and genders are affected by this type of anemia. Sickle cell anemia, Thalassemias, and hereditary spherocytosis are all examples of this inherited form of anemia. RBCs can also be damaged by certain diseases and chemicals, which has led to the end of.

Haemolytic anemia. The most serious form of haemolytic anemia is caused by receiving a transfusion of red blood cells of the wrong blood type.

Symptoms Some symptoms of haemolytic anaemia are the same as those for other forms of anaemia.

- Jaundice
- Fatigue
- Shortness of breath, dizziness, and headaches are all symptoms of a low RBC count, as are cold hands and feet, pale skin, and chest pain.
- Abdominal pain

Blood transfusions, drugs, blood and bone marrow transplants, lifestyle changes, and surgery are all treatments for haemolytic anemia. The spleen may need to be removed in the worst cases. In fact, RBCs are missing. The canopy can be removed to reduce the destruction of RBCs.

Aplastic Anaemia: Aplastic anemia is a blood disorder in which the bone marrow fails to produce enough new blood cells, leading to a variety of health conditions such as arrhythmias, enlarged heart, heart failure, infection and bleeding.

Causes

- Although radiation and chemotherapy are effective against cancer cells, they can also damage healthy cells, such as bone marrow stem cells.
- It is possible to fix this by avoiding contact with these chemicals.
- Immune Deficiency Syndrome - Stem cells in your bone marrow can be involved in the immune system when your immune system destroys healthy cells.

Symptoms

- Pale skin
- Fatigue
- Shortness of breath
- Dizziness
- Headache
- Chest pains

Treatment includes transfusion of blood, bone marrow stem cell transplants, and medications. These treatments are useful for preventing or limiting complications, relieving symptoms, and improving quality of life.

Causes of Anaemia: A healthy diet is always what gives you enough nutrients to meet your body's needs. Therefore, a balanced diet is sufficient to prevent anemia. The main cause of anemia is anemia, folic acid, and iron-rich foods. Anemia is common in children due to low iron content at birth, low iron content in breast milk, and low iron intake in the diet during childhood and adolescence. Nutritional Treatment of Anaemia: Anemia can be treated by simply looking at how much food we help produce hemoglobin. Generally, to combat anemia, people should be aware of the importance of iron, copper, zinc, folic acid, vitamin B-12, and protein. Treatment of anemia requires a combination of iron and vitamin B.

5. Recant advance treatment

Recant advance anemia treatment has improved with new methods like gene therapy and many types of special medicines that help the body produce more amount of RBC cells using hormone called erythropoietin. Recant advance technique for anemia treatment especially with the introduction and a deeper understanding of the root causes of anemia some treatment like that oral iron supplement and blood transfusion are still in use, newer method is included intravenous iron therapies.

6. Prevention and Public health

To protect from anemia require combination of nutrient, medicinal, and public health

measures.These strategies can be divided into three main areas : improving dietary intake in the daily basis education awareness program and promoting behavior medication. A well proper balance diet rich in iron folic acid and other essential nutrient play a major role in preventing anemia.

- **Supplementation program**

In this supplementation program preventing from anemia in many countries especially where anemia is common Ex- Yemen, Pakistan, India crucially during pregnancy in second trimester and weekly iron rich food and folic acid tablet syrup are provided to adolescent both in and out of school. The program are often supports by health department government and crucial in reducing in anemia related complication.

- **Regular screening and early detection**

High risl of anemia chance in like pregnant women infants and older person there are no any symptoms in early stage of the anemia making regular screening indentified before its progresses. Early treatment of the anemia can prevent the development of serious complication symptoms like – fatigue, weakness.

Nutritional program in india like (Anemia mukt bharat)

The program was launched by : Ministry of health and family welfare, Government of India Year : 2018. Purposed of this program: To reduce the prevalence of anemia across different age groups in India, especially children, adolescent, women and pregnant women.

Anemia is a major health issue in India. According to national health survey of India more than 50% of women and children in India suffer from anemia. Anemia Mukt Bharat strategy is implemented to reduce the anemia among six beneficiaries age group children (6-59 months), children (5- 9 years), Adolescents (10 – 19 years), Pregnant and lactating women and women of reproductive age group (15 -49).

AGE GROUP	DOSE
6-59 Months of age	Weekly 1ml and folic acid syrups
5-10 years children	Weekly 1ml iron and folic acid tablets
School going adolescent girl and boy 10 – 19 years	Weekly 1 iron and folic folic acid tablet Each tablet contain 60 mg iron + 400 mg folic acid
Women of reproductive age (Non pregnant non lactating 20 – 49 years	Weekly 1 ml iron folic acid tablet Each tablet contain 60 mg iron + 500 mg folic acid
Pregnant women and lactating mother (0-6 months child)	Daily 1 iron and folic tablet starting from 4 Months of pregnant that is formed second trimester.

7. Diagnosis

Diagnosis involving assessing symptoms, conducting a physical test and utilizing blood test:-

Physical symptoms

- Pale skin
- Fatigue or weakness
- Chest pain
- Shortness of breath
- Dizziness

Some blood test for diagnosis of anemia

(1) CBC (Complete blood count)

The CBC test is basic test for detection of anemia.In CBC test hemoglobin (HB) count It indicate anemia.

(2) Peripheral blood smear

This test identified visualization of RBC under a microscope. It helps to identify the:-

- Abnormal shapes
- Size variations
- Immature cell

(3) Bone marrow biopsy

A bone marrow biopsy is advance technique for diagnostic anemia. The bone marrow is the primary site of RBC production, white blood cells and Platelets. when anemia not clearly by routine test then move to the bone marrow biopsy test help assess whether the functioning normally or affected by diseases.

Ranges of anemia

Age	Heavy	currently	light	Normal count
Children aged 6-59 months	<7.0	7.0- 9.9	10 – 10.9	>_ 11.0
Children aged 5-14 years	< 8.0	9.0 – 10.9	11.0 – 11.4	>_ 11.5
Non pregnant women aged (aged 15 years and over)	<8.0	8.0 – 10.9	11.0 – 11.9	>_ 12.0
Pregnant women	< 7.0	7.0 – 7.9	10.0 – 10.9	>_ 11.0

Treatment

- **Iron deficiency anemia**

Iron supplements

Taking iron tablet for treatment of iron deficiency anemia. Taking of the tablet in empty stomach for faster absorption if facing any adverse effect can be taken after meals. But iron tablet supplement continued for several month the supplement cause constipation and black stool.

Intravenous iron

For those patients who can't tolerate oral iron or have several deficiency ex- iron sucrose, ferric.

Vitamin C supplement

Taking more amount of iron deficiency supplement can enhance the absorption of iron in the body.

- Food high in vitamin C
- Broccoli
- Tamato
- Fruit such as oranges, kiwis
- Cauliflower

- **Sickle cell anemia**

Sickle cell anemia is a genetic blood disorder that effect the shape and function of the RBC cells. since there are no universal cure most patients, treatment focus on managing symptoms, preventing, complication improving quality of life**.**

Some management of sickle cell anemia

- Blood transfusion
- Bone marrow transplant
- Preventing infection
- Supportive care
- Some type of medications

- **Vitamin deficiency anemia**

Vitamin deficiency anemia is treated by various ways like the oral supplement, injections, or dietary changes

- **Thalassemia**

Thalassemia is a genetic disorder affecting the hemoglobin production. Treatment of thalassemia:

- Regular blood transfusion
- Folic acid supplement
- Bone marrow transplant
- Iron chelating therapy

CONCLUSION

Anemia is the most widespread public health problem. It affects all ages especially women and children. It causes by nutritional deficiency and parasitic infection and deficiency of nutrient including vitamin B12 and foliate deficiency are major cause of anemia. In this disease early detection and proper management are to preventing serious health complication. promoting a proper balance diet and iron rich food, folic acid and vitamin B12 and a proper diet.

REFERENCES

1. https://pubmed.ncbi.nlm.nih.gov/static-page/down_bethesda.html
2. https://www.hematology.org/education/patients/anemia
3. https://pmc.ncbi.nlm.nih.gov/articles/PMC6697587/
4. https://www.sciencedirect.com/science/article/pii/S0213911121003113
5. https://bbrc.in/wp-content/uploads/2021/07/Special-Issue-14-7-2021-07.pdf
6. https://archivepp.com/storage/models/article/JbeqyqusP5K9WsAAEia5BLf43Kr6Kl64VpHnM6zqE8uQV2049oQIfJWPkUym/iron-deficiency-anemia-diagnosis-and-treatment-in-primary-health-care-centre.pdf
7. https://juniperpublishers.com/ijcsmb/pdf/IJCSMB.MS.ID.555686.pdf
8. https://www.researchgate.net/publication/323689439_Iron_Deficiency_Anemia_IDA_A_Review
9. https://www.ceghonline.com/article/S2213-3984(24)00041-1/pdf
10. https://www.mdpi.com/2072-6643/16/11/1673
11. https://journalahrj.com/index.php/AHRJ/article/view/170
12. https://indianpediatrics.net/epub062024/UPDATE-00658.pdf
13. Brodsky, R.A. And Jones, R.J., 2005. Aplastic Anaemia. Lancet. 365(9471):1647-56.
14. Chaparro Cm, Suchdev Ps. Anemia Epidemiology, Pathophysiology, And Etiology in Low- And MiddleIncome Countries. Ann N Y Acad Sci. 2019;1450(1):15- 31. Doi:10.1111/Nyas.14092
15. Chiwhane, Anjalee, Shreerang Burchundi, Gajendra Manakshe, And Hemant Kulkarni (2020). "Incremental Prognostic Value of Anemia in Acute Coronary Syndrome from A Rural Hospital in India." Global Heart 15, No. 1. Https://Doi.Org/10.5334/Gh.527.
16. De Sanctis V, Kattamis C, Canatan D, et Al 2017 Feb 20. B-Thalassemia Distribution in the Old World: An Ancient Disease Seen from A Historical Standpoint. Mediterr J Hematol Infect Dis. 2017;9(1):E2017018. Published. Doi:10.4084/Mjhid.2017.018
17. Gupta, V., P. Deshpande, Q. Zahiruddin, And A. Gaidhane (May 2019). Application Of a Multiplex Pcr to Detect Intestinal Parasite Infections in Antenatal Anemia." Journal Of Molecular Diagnostics 21, No. 3, S: S9. Haidar J (2010 Aug). Prevalence Of Anaemia, Deficiencies of Iron and Folic Acid and Their Determinants in Ethiopian Women. J Health Popul Nutr;28(4):359-68. Doi: 10.3329/Jhpn.V28i4.6042.
18. Pmid: 20824979; Pmcid: Pmc2965327. Hercberg S, Rouaud C (1981). Nutritional Anaemia. Child Trop;(133):1-36. Pmid: 12264581. Huang Y, Wang L, Huo J, et al (2019). Prevalence And Causes of Anaemia in Children Aged 6-23 Months in Rural Qinghai,

China: Findings from A Cross-Sectional Study. Bmj Open;9(9):E031021. Published 2019 Sep 8. Doi:10.1136/Bmjopen-2019-031021

19. Jimenez K, Kulnigg-Dabsch S, Gasche C (2015). Management Of Iron Deficiency Anemia. Gastroenterol Hepatol (N Y);11(4):241-250

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